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(54) **SWITCHING DEVICE**

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H01H 13/14 (2006.01)
H01H 13/04 (2006.01)

(52) **U.S. Cl.**
CPC ***H01H 13/14*** (2013.01); ***H01H 13/04*** (2013.01); *H01H 2221/008* (2013.01)

(58) **Field of Classification Search**
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USPC 200/330, 573
See application file for complete search history.

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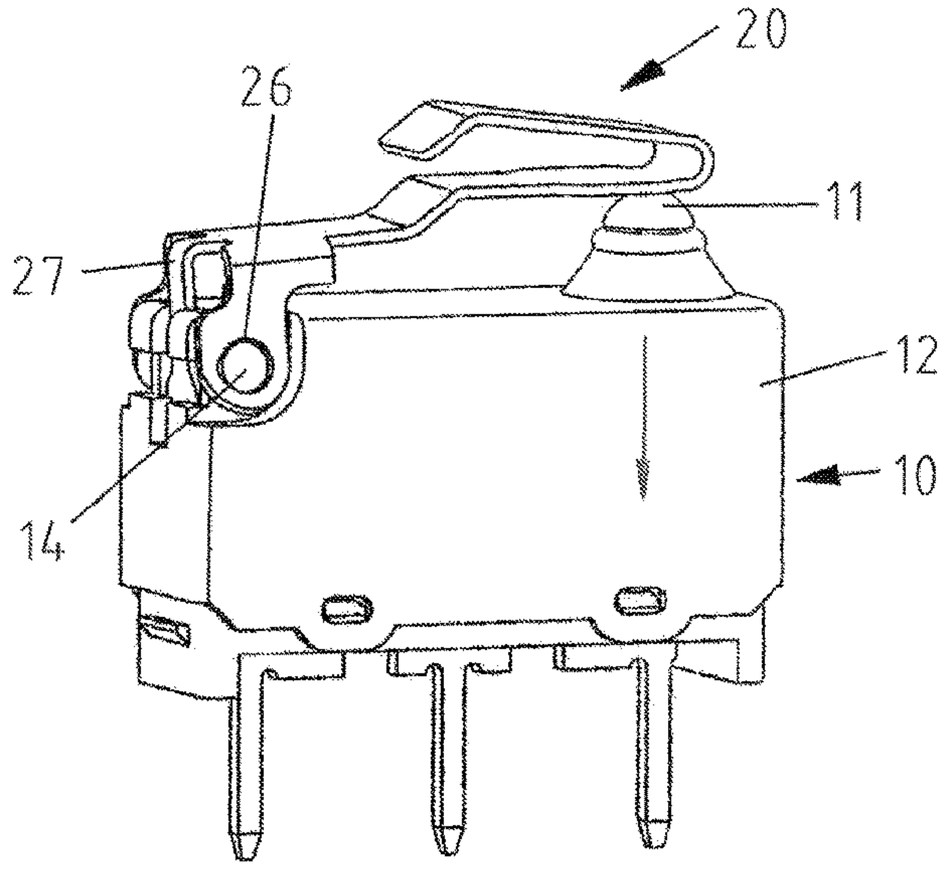
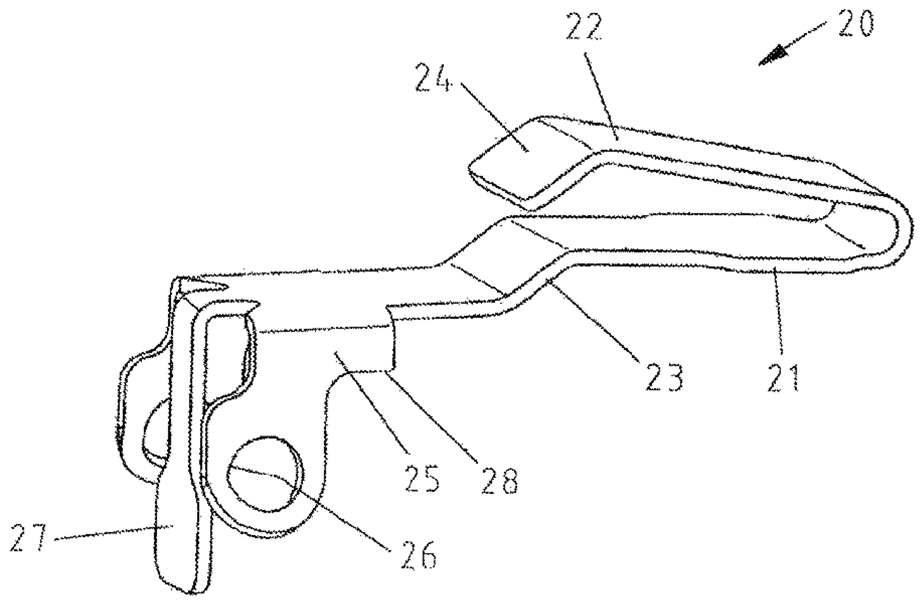
(57) **ABSTRACT**

A switching device includes a switch and an actuating element. The actuating element for a switch includes a U-shaped actuating section. The actuating section includes two different arms with different lengths. The long arm is configured to transfer force to a button of the switch and a free end of the long arm is configured for holding the actuating element. The short arm is configured for the force input and is arranged aligned obliquely to the long arm.

17 Claims, 5 Drawing Sheets





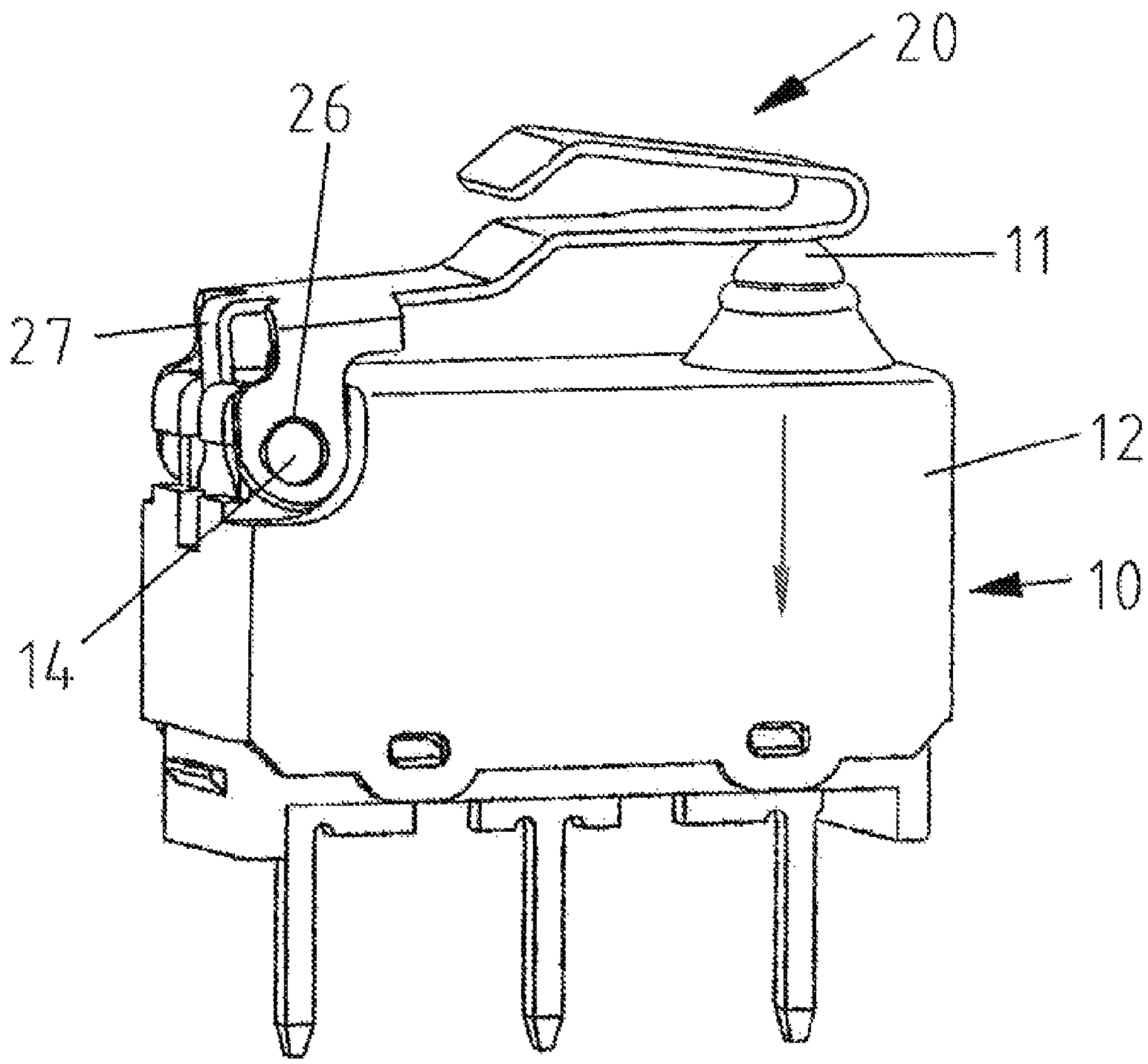


Fig. 1

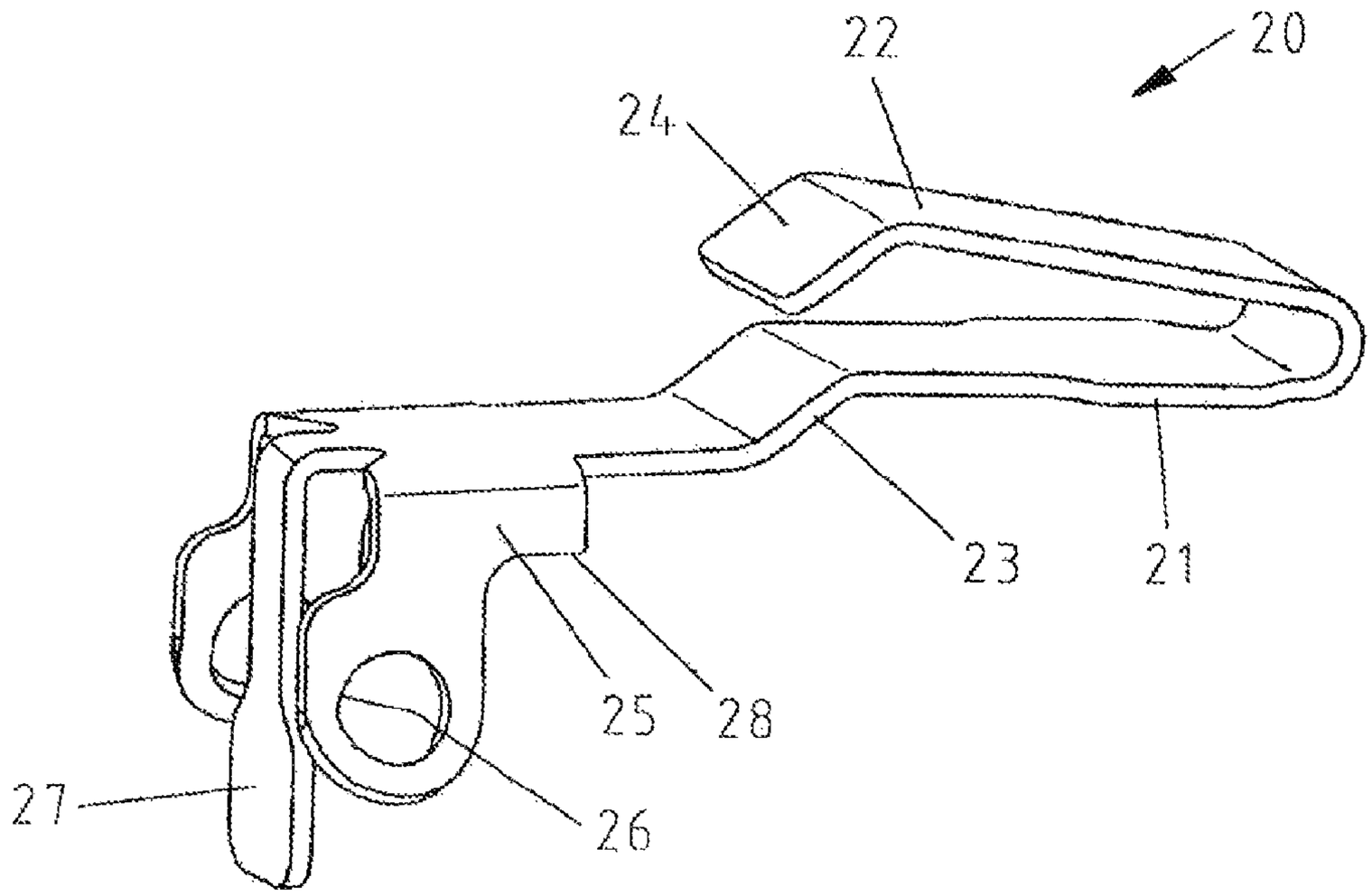


Fig. 2

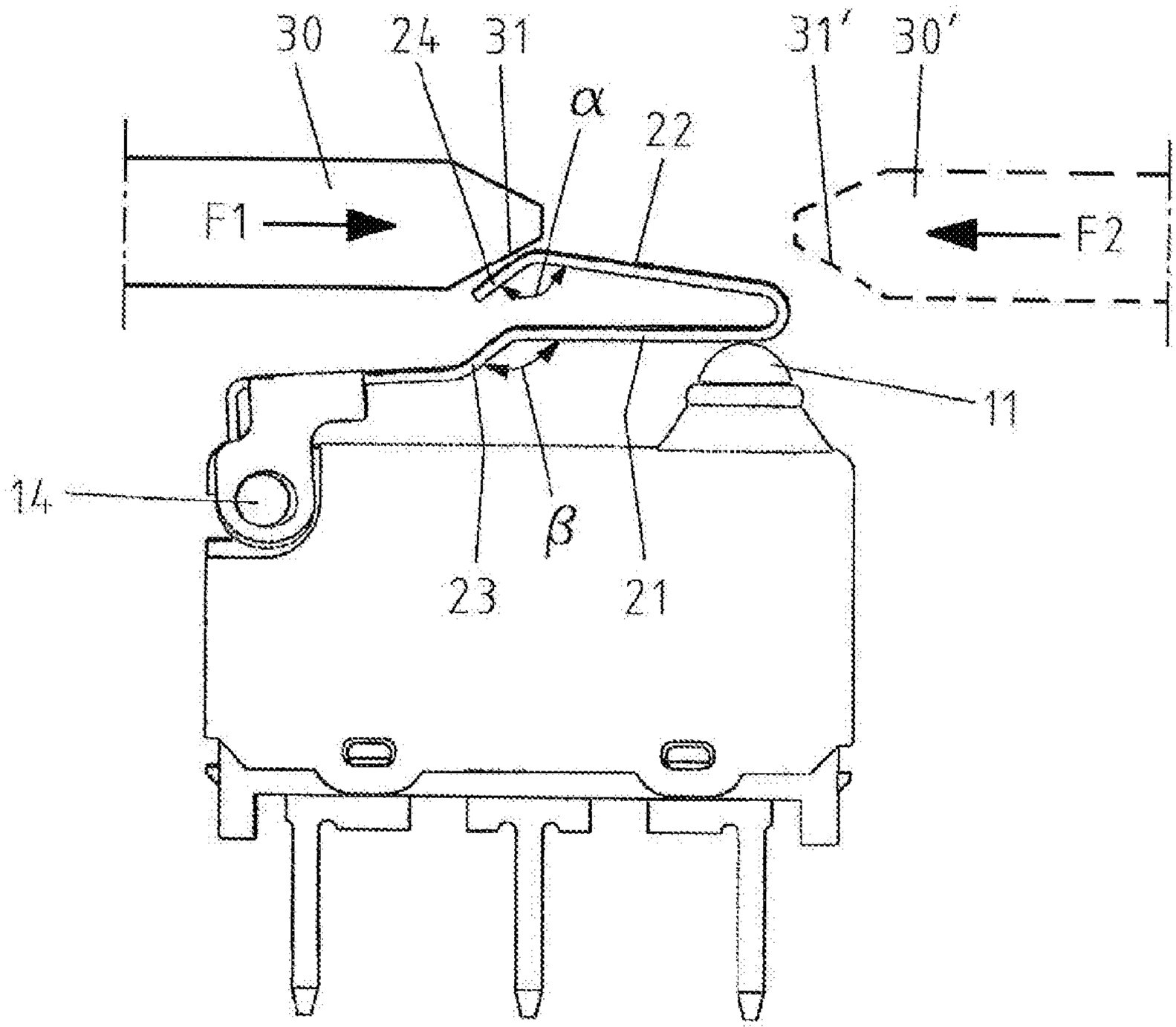


Fig. 3

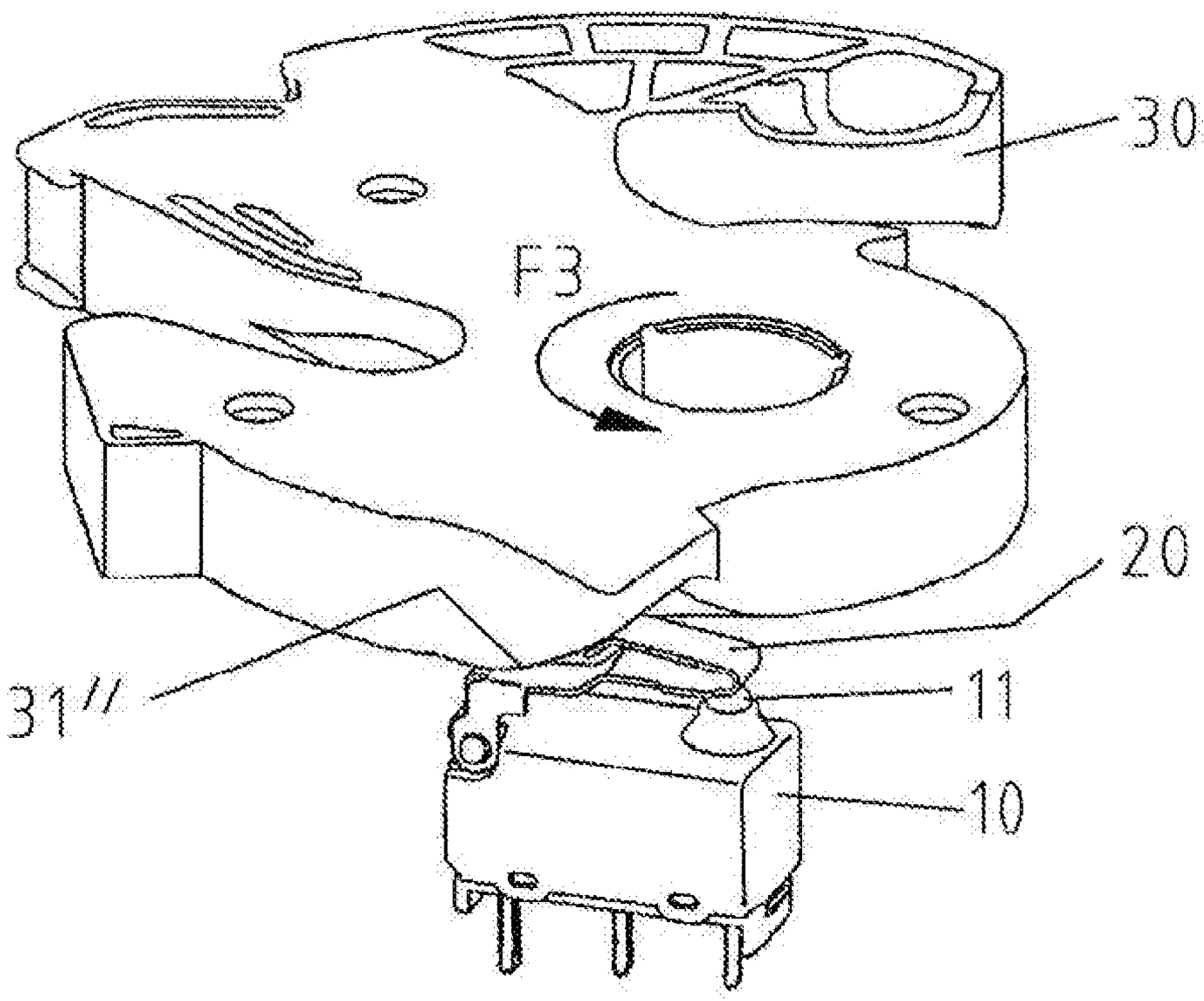


Fig. 4

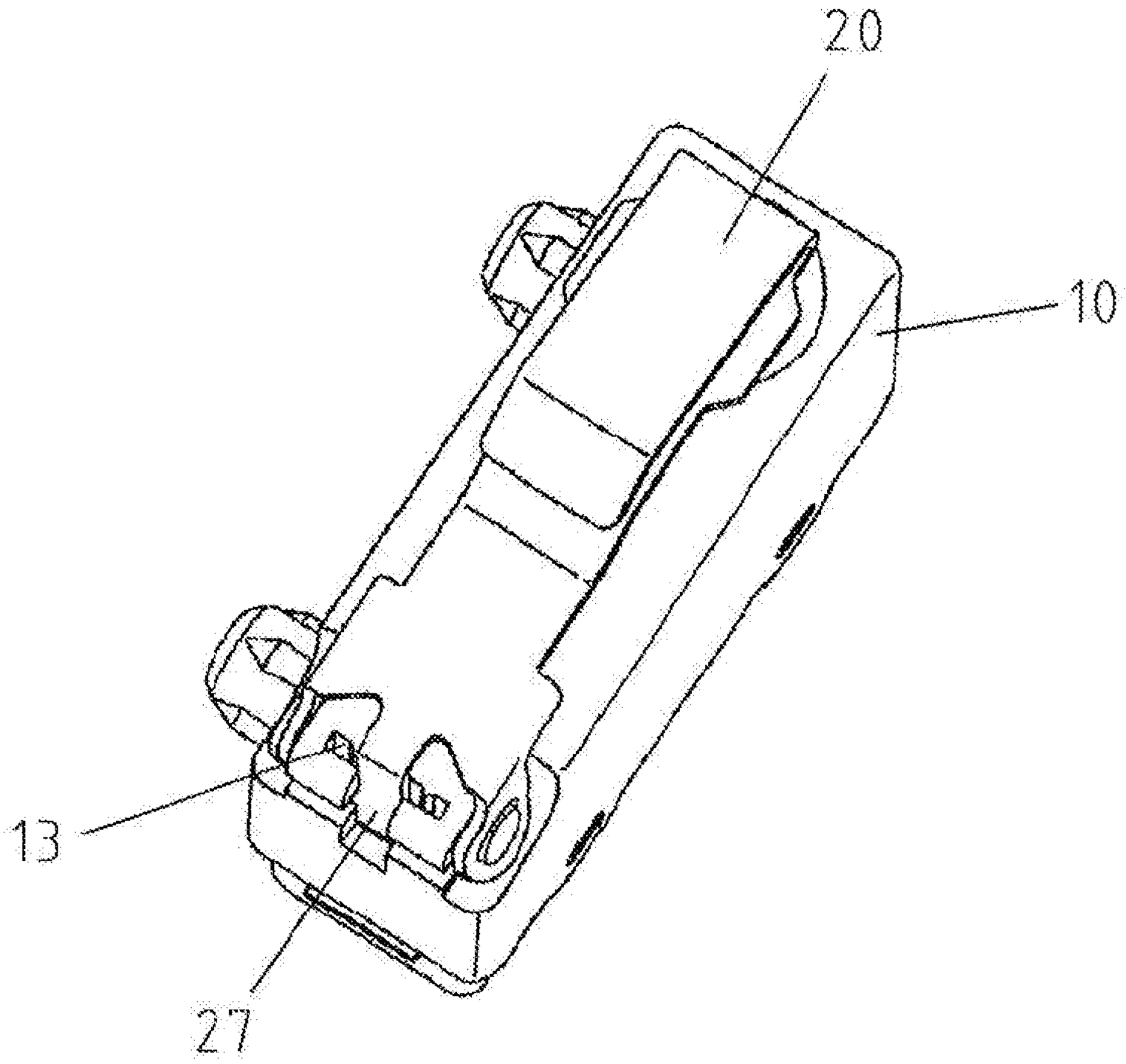


Fig. 5

SWITCHING DEVICE

CROSS REFERENCE TO RELATED APPLICATIONS

This non-provisional patent application claims priority under 35 U.S.C. § 119(a) from Patent Application No. 10 2016 122 423.5 filed in Germany on Nov. 22, 2016.

TECHNICAL FIELD

The present disclosure relates to a switching device with a switch which is actuated by a push button with an additional actuating element.

BACKGROUND

The switching devices with additional actuating element are already known. These additional actuating elements allow the use of a switch adaptation to different conditions of the device, in particular to different actuating forces and switching paths. In addition to adaptation of several long switching paths and various high actuating forces, adaptation to forces from different directions of action is desired.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is a perspective view of an switching device according to the invention;

FIG. **2** is a perspective view of the switching device of FIG. **1** with an actuating element;

FIG. **3** is a perspective view of the arrangement of the switching device of FIG. **1** additionally with an action member;

FIG. **4** is a perspective view of the arrangement of the switching device of FIG. **1** additionally with a pawl;

FIG. **5** is a top view of the arrangement of the switching device of FIG. **1**.

The following implementations are used for the description of the present disclosure in conjunction with above FIGS.

DETAILED DESCRIPTION OF THE EMBODIMENTS

Hereinafter technical solutions in embodiments of the present disclosure are described clearly and completely in conjunction with the drawings in embodiments of the present disclosure. Apparently, the described embodiments are only some rather than all of the embodiments of the present disclosure. Any other embodiments obtained based on the embodiments of the present disclosure by those skilled in the art without any creative work fall within the scope of protection of the present disclosure. It is understood that, the drawings are only intended to provide reference and illustration, and not to limit the present disclosure. The connections in the drawings are only intended for the clearance of description, and not to limit the type of connections.

It should be noted that, if a component is described to be "connected" to another component, it may be connected to another component directly, or there may be an intervening component simultaneously. All the technical and scientific terms in the present disclosure have the same definitions as the general understanding of those skilled in the art, unless otherwise defined. Herein the terms in the present disclosure are only intended to describe embodiments, and not to limit the present disclosure.

The switching device is shown in FIG. **1** according to one embodiment of the present disclosure. In at least one embodiment, the switching device comprises a switch **10** a cuboid switch housing **12**. A push button **11** protrudes out from the top surface of the switch **10**. The push button **11** is configured to be pressed along the direction of arrow as shown in FIG. **1**, to trigger a switch contact in the housing **12**. In at least one embodiment, the switch **10** is a micro-switch.

The switching device further comprises an additional actuating element **20**. The actuating element **20** extends along the top surface of the switch **10** and is arranged opposite the push button **11**. The actuating element **20** is work as a spring. For mounting, A turning supporting portion **14** is formed at the left side of the one side wall of the housing **12**, for turnably supporting the actuating element **20**. The turning supporting portion **14** turnably supports the actuating element **20** formed of a plate member having elasticity, with a supporting portion **26** being formed on one end side of the actuating element **20** to the left side in the drawing, such that the supporting portion **26** is supported at the turning supporting portion **14**. In at least one embodiment, the supporting portion **26** is a round opening, the turning supporting portion **14** is a circular cylinder, the supporting portion **26** is rotatable sleeved on the turning supporting portion **14**.

The actuating element **20** is disposed as a U-shaped shape as shown in FIG. **2** and comprises two arms **21**, **22**. A bend **23** is formed on the central region of the long arm **21** and extends to the supporting portion **26**. Branches **25** are respectively disposed on the both sides at the free end of the long arm **21**. A return arm **27** is also disposed at the free end of the long arm. The return arm **27** is bent at a substantially right angle to the long arm **21**, so that the actuating element **20** can be elastically returned after being urged and the button **11** is released again. As shown in FIG. **5**, the return arm **27** is received in the receiving groove **13** of the housing **12** to fix the braking portion **20**. For a secure fixing this return arm **27** in the area is training in form of a flag, with which it sits in the receiving slot **13**.

The long arm **21** of the actuating element **20** is configured to transmit power to the push button **11**. The long arm **21** bears against the push-button **11** of the switch **10** and, upon application of force, can press the push button **11** along its actuating direction, into the housing **12** of the switch **10**, press to trigger the switch contact therefore. An external force acts on the short arm **22** of the actuating element **20**, that is, the force is applied on the short arm **22**. The short arm **22** is, as best seen in FIG. **3**, aligned obliquely to the long arm **21** in at least one embodiment. By this orientation, it is possible that an action member **30'** exerts a force F**2** on the short arm **22** when the abutment side **31'** of the action member **30'** moves against on the short arm **22**.

In at least one embodiment, a bend **24** is disposed at the free end of the short arm **22** such that an obtuse bend angle α results between the bend **24** and the short leg **22**, in this embodiment, the bend angle of the bend **24** is 135°. The bend **24** is oriented so that a force F**1** from an action member **30** from the other side on the switch **10** can act, because the force F**1** is at a touch of the abutment side **31** of the action member **30** at the bend **24** of the short atm **22** introduced into the actuating element **20**. Furthermore, the force can also be linear from above or obliquely from the action member.

Please refer to FIG. **4** together. In FIG. **4**, another actuating element **30"** is shown. In this embodiment, the actuating element **30"** is a pawl of a locking system. The actuating element **30"** comprises an abutment side **31**, which

in at least one embodiment can apply a rotationally actuating force F3 to the bent **24** of the short arm **22**. It is understood that this rotationally actuating force can also be applied in the opposite direction of rotation.

Thus, with this new switching device, a variably deployable switch **10** is available, which can be installed in an electrical device in different orientations, since both a linear force F**1**, F**2** and a rotational force F**3** can occur. In at least one embodiment, the additional actuating element **20** in this case has a very compact design. It is located almost in the shadow of the switch **10** and does not exceed this switch **10**. An over-stroke is intercepted by the short arm **22**. This is further assisted by the fact that a bend **23** is disposed on the long arm **21** below the bend **24** of the short arm **22** likewise provided, as is formed a step on the long arm **21**. The bend **23** preferably has a greater or the same angle of curvature β as the angle of curvature α of the bend **24** of the short arm **22**, so that the short arm **22** can be lowered beyond the switching point of the contact system of the switch **10** in the direction of the long leg **21** during the over-stroke, to extend the life of switching device.

Furthermore, underside of the branches **25** of the long arm **21**, a support point **28** is provided, as shown in FIG. **2**. In case of a force is applied to the actuating portion **20**, the actuating element **20** can be pivoted slightly about the supporting portion **26**, since then the long arm **21** with the support point **28** is supported at the top surface of the switch housing **12**.

In at least one embodiment, the actuating element **20** is formed of sheet metal. But it is also possible other leaf spring material, such as plastic.

The switching device according to this invention can be adapted to a large actuation path without additional bulkily operating levers. In addition, actuation forces from different directions of action can be absorbed by the switching device without changing the actuating element.

In the present embodiment, the bend of the short leg can be designed so that it touches the long leg or that it touches the long leg from a certain deflection. As a result, the spring properties can be influenced accordingly.

In the present embodiment, the actuating element **20** is preferably mounted on the housing **12**. In other embodiments, the actuating element **20** may be mounted on a device around the switch **10**. It is understood that the actuating element **20** has an adapted shape to cooperate with the switch **10** in different arrangements.

In the present embodiment, the return arm **27** is received in the receiving groove **13** of the housing **12** to fix the actuating element **20**. In other embodiments, the return arm **27** may be fixed by an adhesive or a rivet connected to the housing **12** of the switch **10**, or may also be integrally formed with the housing of the switch **10**.

Although the invention is described with reference to one or more embodiments, the above description of the embodiments is used only to enable people skilled in the art to practice or use the invention. It should be appreciated by those skilled in the art that various modifications are possible without departing from the spirit or scope of the present invention. The embodiments illustrated herein should not be interpreted as limits to the present invention, and the scope of the invention is to be determined by reference to the claims that follow.

Described above are preferable embodiments of the present disclosure, which are not intended to limit the present disclosure. All the modifications, equivalent replacements and improvements in the scope of the spirit and principles of the present disclosure are in the protection scope of the present disclosure.

The invention claimed is:

1. A switching device comprising:

a switch, a push button protruding out from a housing of the switch and configured to be pressed to trigger the switch;

an actuating element which is elastic arranged on the switch to operate the push button of the switch upon a force;

wherein the actuating element comprises two different arms with different lengths and the two different arms are disposed as a U-shaped shape, a long arm of the two different arms transfers force to the push-button of the switch, a free end of the long arm holds the actuating element; and

wherein a short arm of the two different arms is arranged aligned obliquely to the long arm.

2. The switching device of claim **1**, wherein the short arm comprises a bend facing the long arm at the free end of the short arm, in rest position of the actuating element, the bend of the short arm is not touched the long arm.

3. The switching device of claim **1**, wherein branches are respectively disposed on both sides at the free end of the long arm with supporting portions respectively, turning supporting portions are formed on the housing of the switch correspondingly for holding the actuating element.

4. The switching device of claim **3**, wherein the supporting portion is a round opening, the turning supporting portion is a circular cylinder, the supporting portion is rotatable sleeved on the turning supporting portion.

5. The switching device of claim **1**, wherein a return arm is disposed at the free end of the long arm.

6. The switching device of claim **5**, wherein a receiving groove is disposed on the housing for receiving the return arm.

7. The switching device of claim **5**, wherein the return arm is formed integrally with the switch housing of the switch.

8. The switching device of claim **2**, wherein a bend is formed on a central region of the long arm and disposed below the bend of the short arm.

9. The switching device of claim **8**, wherein the bend of the long arm is formed a step on the long arm.

10. The switching device of claim **8**, wherein an angle of the bend of the short arm is equal to or smaller than an angle of the bend of the long arm.

11. The switching device of claim **1**, wherein the actuating element is formed of sheet metal or plastic.

12. The switching device of claim **1**, wherein the switch is a microswitch.

13. The switching device of claim **1**, wherein the free end of the long arm is mounted on the switch for holding the actuating element.

14. The switching device of claim **1**, wherein the free end of the long arm is mounted around the switch for holding the actuating element which is disposed separately from the switch.

15. The switching device of claim **1**, wherein the short arm extends along a top surface of the switch.

16. The switching device of claim **1**, wherein the short arm and long arm are disposed substantially parallel.

17. The switching device of claim **1**, wherein the short arm is formed from an opposed end of the long arm away

from the free end, the short arm is extended toward the free end of the long arm from the end of the long arm.

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